



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

JANUARY – APRIL 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULAR PROGRAMME

CMT 420: SYSTEM PROGRAMMING

Date: APRIL 2015	Duration: 2 Hours
Instructions: Answer Question ONE and any other TWO Questions.	

- Q1. a) Explain the following concepts;
- i) System software
 - ii) Application software
 - iii) Compiler
 - iv) Debugger
- b) Briefly expound on FOUR fundamental data types in C language, explaining their nature, memory size allocations and nature of representations. **(8 marks)**
- c) Consider the following piece of code;
- ```
char x, y; x = 16; y = 17;
```
- What is the value of the following expression?
- i)  $x = x \& y;$
  - ii)  $y = x/y;$
  - iii)  $x >> 3$
  - iv)  $y \ll 1$
- (8 marks)**
- d) State FOUR advantages of libraries in programming. **(4 marks)**
- e) Assume that each element of an array 'A' stored in row-major order occupies four bytes of memory. If 'A' is declared as: `int a[10] [20]`, and the address of the tissi element of 'A' is 2000, find the address of the array element `a[5] [12]`

- Q2. a) Consider the following program that establishes a pipe between a parent and a child process. The parent process arises, and the child process reads. Missing keywords and/or function calls are shown underlined. Fill in the twelve (12) blanks accordingly.

**(12 marks)**

```
#include <stali.h>
#include <stalib.h>
Int main (int argc, char** argv)d
_____fd[_____];
Int ubytes;
Pid_t childpid;
Char string [] = "Dear Mom,"
Char butter [80];
_____ (fd); /* create a new pipe*/
Childpid = _____; /*sparn a child*/
If(childpit = =0)d
Close (fd [_____]);
nbytes = _____ (fd [_____]; butter, size of (butter),
if (nbytes < _____) { exit (-1); }
else { exit (0); }
}
Elese d
nbytes = _____ (fd [_____]; string, (strlen(string)H);
close (fd [_____]);
if (nbytes < _____) { exit (-1); }
else { exit (0); }
} /* end if */
Return (o);
y/* end main */
```

- b) Suppose you have a C source file named prog.c provide a GNULINUX command that would only compile this source code with all warning flags turned on.
- (3 marks)**
- c) Provide a GNV/Linux command that would display on the screen the result of preprocessing C source file named main.c.
- (2 marks)**
- d) Provide a GNV/Linux command for getting detailed help on the system call open.
- (3 marks)**
- e) Provide a CNU/Linux command that lists all tasks started in the current terminal session.

**(3 marks)**

- Q3. a) Explain how the accept ( ) system call works. **(7 marks)**
- b) Write a complete C program that sums all even integers in an inclusive range specified at the command line as two integer values. You must implement this summation using a function with the prototype; int sunfren(int a, int b); that would sum an even integers between a and b, inclusive. **(10 marks)**
- c) What is a structure? With the help of an example show a structure is defined in C. **(3 marks)**
- Q4. a) Consider the following series of system calls. Explain in detail what effect is obtained after each sigprocmask call.
- ```
Sigset_t setA; setB;
Sigfillset (&setA);
Sigfillset (&setB);
Sigdelset (&setB, SIGINT);
Sigdelset(&setB, SIGTERM);
...
Sigprocmask (SIG_SETMASK, &setA, NULL);
...
Sigprocmask (SIG_UNBLOCK, &setB, NULL);
...
Sigprocmask (SIG_UNBLOCK, &setA, NULL);
```
- b) “Blocked signals do not get lost.” Is this statement true or false? Explain briefly. **(5 marks)**
- Q5. a) What will the following program output when executed. Explain the output in sufficient detail. **(15 marks)**
- ```
#include<signal.h>
#include<unistd.h>
#include<stdio.h>
Void sigchld_handler (int signo) {
 Printf (“D/h”);
 Return’s
} /*end sigchld_handler*/
int main (void)
struct sigaction act;
act.sa_handler = sigchld_handler’s
sigactions (SIGCHLD, &act, NULL);
if (fork () == 0)
 sleep (3)
 printf (“A/n”);
```

```

 sleep (2);
 exit (0);
 }
 Else
 if (fork () == 0) d
 sleep (8);
 printf("E/n");
 sleep (5);
 exit (0);
 }
 Else
 }
 else
 {
 printf("B/n");
 sleep (30);
 printf("f/n");
 } /*end if */
 Return 0;
} /* end main*/

```

- b) Describe briefly what the command `chmod o-rw, gtr-w, o-rwx file.txt` accomplishes.

**(5 marks)**

**\*END\***